

S/N 10/620,192

Response to Office Action Dated: June 4, 2007

Date: July 31, 2007

REMARKS

This After Final Amendment is in response to the June 4, 2007 Office Action. The Action was made final. Prior to the Office Action, claims 1, 4, 5, 8-17, 20-32 were pending. On entrance of this After Final Amendment, claims 1, 4-5, 8-17 and 20-32 will be pending. Claim 29 has been cancelled. Claims 1, 14, 15 and 20 are amended.

Claims 28 and 29 stand rejected under 35 U.S.C. § 112 ¶ 2. Claim 28 has been amended and claim 29 has been cancelled.

Claims 1, 8-11, 13-14 and 28-32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,937,753 to O'Dell in view of U. S. Patent No. 5,064,291 to Reiser. The Examiner asserts that O'Dell discloses an apparatus for taking a plurality of line images of different portions of a wafer and includes an illumination device adapted to change the type of illumination in a synchronous manner (including a non-illuminated form of illumination) with the taking of the plurality of line images. The Examiner states that O'Dell does not include a processor that separates the line images into at least two separate images of different illumination. The Examiner applies Reiser asserting that Reiser includes a camera for taking line images having a processor for separating the line images into at least two wafer images of different illumination. Office Action pages 4 and 5.

Applicant respectfully traverses the Examiner's asserted disclosures and teachings of both O'Dell and Reiser. O'Dell discloses an automated wafer defect inspection system. First, O'Dell requires that the wafer be in a specific known orientation in both x, y and Θ with respect to the camera for the invention to work for its intended purpose. Unlike the present claimed invention, O'Dell is not for non-oriented wafer (or other subject matter) applications. Second, O'Dell does not teach or suggest the taking of line images (in claims 1, 14 and 30), or line images across a substantial portion of the wafer (in claims 1 and 14). O'Dell discloses two embodiments. In a non-continuous system, i.e. non-moving wafer, O'Dell uses a camera to collect "an image", then indexes to the next wafer to capture another image. Col 8 ll. 10-17. In a continuous system, i.e. moving wafer, the camera shutter is left open and continuously records the viewing area. At

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calculated time intervals, a strobe light is used to capture or “freeze” “an image” at the precise time the wafer passes under the viewing area. Col. 18 ll. 39-47. Although O’Dell generally discloses that bright or darkfield illumination may be used, there is no teaching or suggestion that the disclosed strobe embodiment alternately changes the type of illumination (i.e. brightfield or darkfield) for each strobe or captured image. Applicant asserts that no illumination at all, i.e. completely dark, is not properly considered a form of illumination under the present application.

Reiser equally requires particular positioning of the solder joint to be imaged and does not teach or disclose the taking of line images under sequentially and alternately changing forms of illumination. Reiser further does not teach or suggest the separation of line images into at least two separate images as asserted by the Examiner. Reiser discloses an apparatus and method for inspecting solder joints. Reiser discloses a camera positioned over one or more solder joints and two illumination devices positioned at different angles. A first pixelized image is taken under one illumination and a second pixelized image is taken under the alternate illumination angle. Each image is then “scanned” electronically to retrieve the numeric values corresponding to the individual pixels.” Col 8 ll. 58-61. These scanned values are then compared to a stored array of empirically calculated and predetermined values to determine the adequacy of the imaged solder joint. Reiser discloses that where a “scanner” is used that is capable of recording several multi-color images *simultaneously*, two different light sources can be used and separate images of each illumination may be generated, simultaneously. Col. 9 ll. 25-34. Using the Examiner’s example on Col. 3 ll. 42-43, Reiser does not teach the generation of separate (or combined) images through *sequential* taking of *line* images having *alternating* forms of illumination as claimed in claims 1, 14 and 30.

Claims 1 and 14 have been amended to clarify that the wafer is positioned in an unknown orientation with respect to the camera. Claims 1 and 14 have been amended to clarify that each line image is of a different portion of the wafer and that the alternating types of illumination repeat in succession as the plurality of line images are taken.

Claim 8 is not rendered obvious at neither O’Dell or Reiser discloses the taking of line

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images as explained above.

Claims 9, 10, 11 and 13 are allowable based on dependence from allowable base claim 1.

Respecting claim 14, the Examiner states that O'Dell does not disclose that a single interlaced image is "found" or the separation of the interlaced image into separate images having different illumination. The Examiner asserts that Reiser discloses that a single interlaced image is found in an array and that the processor separates the interlaced image into separate images having the same illumination. Office Action page 7. Respectfully, Applicant finds no such teaching in Reiser and further no teaching of the single interlaced image made from the plurality of line images having different types of illumination as claimed in claim 14. The cited portions of Reiser, Figure 11 and Col. 2 ll. 66- Col. 3 l. 1, provide no support against claim 14. The reference to Column 2 describes the Reiser process to build a table or array of reference values taken, not from a wafer or actual part, but from a test set up having a metal plate 20 coated with solder which is then angled or tilted about stationary lighting sources (only 1 turned on at a time) to produce and record reflected light intensities into an array for reference information when actual solder joints are examined and then compared. See Col. 5 ll. 11 – Col. 6 l. 2; Figure 2. As noted, the reference light intensities are taken through 0 – 90 degrees under illumination fixed at one angle, and then 0 – 90 degrees under a second illumination fixed at another angle. Col. 5 ll. 58-66. This array or reference table, is not the claimed interlaced image generated through sequential taking of line images, and further of line images of alternating types of illumination. Claim 14 has been amended to further clarify the non-oriented nature of the wafer, that each sequential line image is of a different portion of the wafer and that the alternating of illumination types repeats as the line images continue across the wafer.

Claim 28 is allowable based on the interlaced image and alternating illumination types as explained in claim 14 above.

Claim 29 has been cancelled.

Claim 30 is allowable as neither O'Dell or Reiser discloses the taking of sequential line images under alternating types of illumination and separation of the line images into images

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having the same type of illumination.

Claims 31 and 32 are allowable based on dependence from allowable claim 30. Claim 31 is further allowable based on inclusion of the single interlaced image as explained by Applicant in claim 14 above.

Claims 15, 17 and 24-27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over O'Dell in view of Reiser, as applied to claims 1, 14 and 30 and further in view of U.S. Patent No. 5,861,910 to McGarry. The Examiner restated the asserted teachings of O'Dell and Reiser and applies McGarry for disclosure of the makings or indicia on the wafer as identification of the wafer. Office Action p. 10. Applicant reasserts the traversal of the asserted teachings of O'Dell and Reiser respecting the taking of line images under alternating forms of illumination and the generation of a single interlaced wafer image of the alternately illuminated line images. Claim 15 has been amended to further clarify the non-oriented positioning of the wafer, that each line image is of a different portion of the wafer and that the alternating illumination is repeated as the line images are taken across the wafer.

With respect to claim 17, the rejection appears based on the limitation of a single interlaced image. Claim 17 as amended in the response to the first office action does not include those limitations. Applicant asserts the claim is allowable over the references cited based on the sequential taking of a plurality of line images and the locating and reading of wafer markings.

Claim 24 is allowable based dependence from allowable base claim 17 and for the reasons described under claim 1 above that O'Dell does not teach or suggest the claimed alternating types of illumination for each line image taken.

Claim 25 is allowable based on dependence from base claims 17 and 24 and for the reasons stated under claim 1 that Reiser lacks teaching of the separation of the sequentially taken line images as claimed.

Claim 26 is allowable based on dependency from allowable base claims and further for the reasons stated under claim 1 that Reiser does not teach or suggest the separation of the sequentially taken line images, but rather simultaneously captures images under alternate

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lighting, clearly distinguishable from the claimed invention. It is asserted that Reiser's images are not separated at all, but are simultaneously recorded and separately captured. This is evident from Reiser's description that these "individual, multicolor images . . . may be combined to produce a full color image." Col 9 ll. 25-29.

Claim 27 is allowable as Reiser does not teach the claimed interlaced image as explained under claim 14.

Claim 4 is stands rejected under 35 U.S.C. § 103(a) as being unpatentable over O'Dell, and Reiser, as applied to claim 1, and further in view of U.S. Patent No. 5,455,870 to Sepai. Claim 4 is allowable based on dependency from allowable base claim 1. Applicant further asserts that Sepai is not applicable for non-oriented applications as a positioning table aligns the subject to be inspected with the cameras.

Claim 5 stands rejected under 25 U.S.C. § 103(a) as being unpatentable over O'Dell in view of Reiser, as applied to claim 1, and further in view of U.S. Patent No. 6,075,883 to Stern. Claim 5 is allowable based on dependency from allowable base claim 1.

Claim 12 stands rejected under 25 U.S.C. § 103(a) as being unpatentable over O'Dell in view of Reiser, as applied to claim 1, and further in view of U.S. Patent No. 5,825,913 to Rostami. Claim 12 is allowable based on dependency from allowable base claims 11 and 1.

Claims 16 and 20 stand rejected under 25 U.S.C. § 103(a) as being unpatentable over O'Dell in view of Reiser and McGarry, as applied to claims 16 and 17, and further in view of Rostami. Claims 16 and 20 are allowable based on dependency from respective allowable base claims.

Claims 21-23 stand rejected under 25 U.S.C. § 103(a) as being unpatentable over O'Dell in view of Reiser and McGarry and further in view of Stern. Claims 21 and 23 are allowable based on dependency of the respective base claims.

It is respectfully submitted that this Amendment traverses and overcomes all of the Examiner's rejections to the application. It is further submitted that this amendment is suitable for entry after a final action under 37 C.F.R. 1.116. No new issues have been added which would

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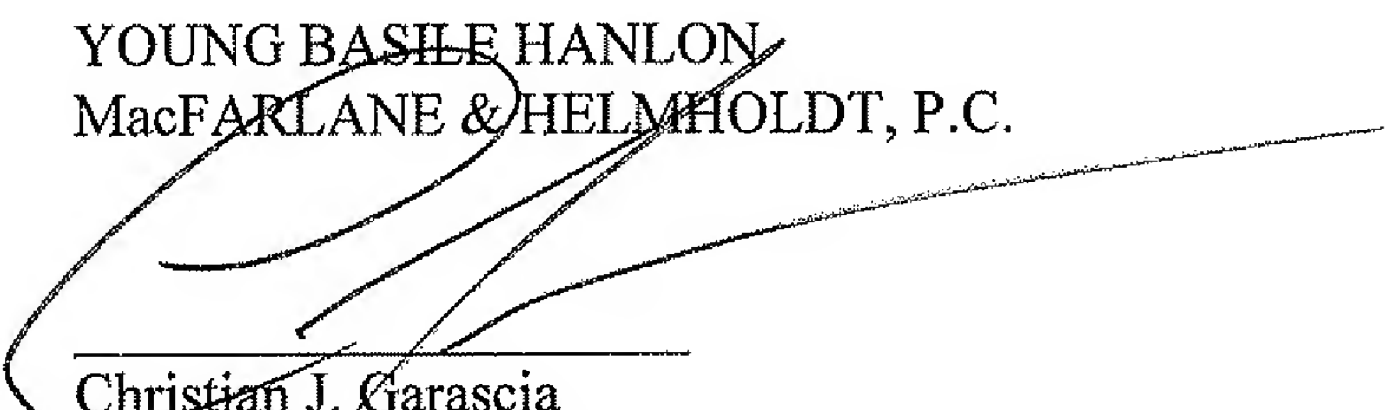
require a new search, and no new matter has been added. The amendments could not have been made in the prior office action response as the primary cited references of O'Dell, Reiser, Stern and Sepai were first cited in the final action. Thus, entry of this amendment is warranted and hereby requested.

It is respectfully submitted that this Amendment places the application in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact the Applicant's attorney at the telephone number listed below.

Respectfully submitted,

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